

Climate Technology Bazaar,
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New Delhi

U.S.–India Climate Change Partnership



A Compendium of Activities



Sponsored by
The United States Agency for International Development (USAID)

messages

Chargé d'Affaires, U.S. Embassy, New Delhi

AS RELATIONS BETWEEN INDIA AND THE UNITED STATES STRENGTHEN, it is fitting that we intensify our climate change cooperation. The U.S. Mission to India, in cooperation with Indian organizations involved in energy and environmental issues, has had excellent success mitigating greenhouse gas emissions during the past decade. Much of that work has focused on enhancing thermal power generation efficiency or promoting biomass fuels.

President Bush and Prime Minister Vajpayee have met five times to discuss the relationship between our two countries. Energy and environment issues have been specifically cited as contributing to this relationship and to economic development.

Today, through the U.S.-India Partnership on Climate Change, we build on this past success and look toward new and exciting areas of collaboration. The compendium that follows is a testament to our bilateral relations and a pledge to continue working closely together on issues of global importance.

Through this partnership, we plan to launch new activities that explore technology cooperation, research, capacity building, strengthening of institutions, outreach, and adaptation issues. There is much that each of our countries can contribute to these areas and much that we can learn from each other.

Energy and environment will continue to be an important area of cooperation for India and the United States. Let us work together and apply our skills, knowledge, and experience to build a better future and a cleaner environment.

Robert O. Blake, Jr.
Chargé d'Affaires ad interim
U.S. Embassy, New Delhi

Senior Climate Negotiator, United States

THE UNITED STATES AND INDIA have enjoyed many years of collaboration addressing energy and environment issues. Of great significance has been our work on climate change — an issue that both countries take seriously. Over the past year, this work has been strengthened through the U.S.–India Partnership on Climate Change.

This document sets out the broad framework for U.S.–India cooperation on climate change. The suite of activities represents an attempt to bring together expertise and experience from a diversity of institutions and individuals in the United States and India.

The issue of global warming is complex and multifaceted. Effective solutions must involve multiple approaches, multiple technologies, and multiple partners. A robust and flexible partnership between India and the United States will help to address the many challenges presented by this global issue.

Harlan L. Watson
Senior Climate Negotiator
and Special Representative
U.S. Department of State





introduction

The United States and India have worked collaboratively for many years on global climate change. Much of the past work has focused on identifying and implementing strategies to reduce greenhouse gas (GHG) emissions from India's many thermal power plants. Great progress has been made, and both countries have benefited from an exchange of ideas and information, and from technology cooperation.

A comprehensive summary of this ongoing work is contained in the U.S. Agency for International Development (USAID)/India publication entitled **U.S.–India Cooperation on Climate Change**.

Following President Bush's and Prime Minister Vajpayee's announcement of November 2001, to expand and to broaden bilateral dialogue and cooperation in several key areas, the United States and India issued a Joint Statement on Climate Change announcing their intention to enhance ongoing collaborative projects in clean and renewable sources of energy, energy efficiency and energy conservation on May 6, 2002.

A broad coalition of U.S. Government agencies, led by the U.S. Department of State, began a dialogue with counterparts from the Government of India, led by the Ministry of Environment and Forests, on how this partnership could be strengthened. This process was given substance through a series of visits to India by representatives of U.S. agencies.

The U.S. Embassy/New Delhi Science and Environment Office coordinated these visits and the USAID/India Office of Environment, Energy, and Enterprise linked these activities to ongoing activities in India. The ensuing discussions resulted in an outline of a broad program of cooperation focusing on research, technology cooperation, carbon sequestration, market-based and institutional approaches, and adaptation. This series of activities has been linked together under the **U.S.–India Partnership on Climate Change**.





Several of the ideas developed under the partnership are new, such as exploring the potential for a hydrogen economy. The United States will host the initial meeting of the International Partnership for the Hydrogen Economy (IPHE) November 18-21, 2003 in Washington, D.C., and looks forward to working with India in the effort to collaborate with other countries to move toward a hydrogen economy. Many of the cooperative activities, such as promotion of renewable energy or clean alternative fuels, build on demonstrated success in India and the United States. All look to identifying the best that our two countries have to offer in terms of exchanges among leading scientists and policy makers on development and deployment of cutting-edge technologies. Together, we can forge approaches that promote economic prosperity while conserving precious natural resources and the global environment.

Another new initiative is the Carbon Sequestration Leadership Forum (CSLF), a multilateral effort through which the United States and India are collaborating. The inaugural CSLF ministerial meeting in June 2003 brought together ministers — including Minister of Power Geete and Energy Secretary Abraham — and experts from 15 countries with substantial interest in the sequestration of carbon emissions from the production or consumption of fossil fuels, in particular coal. Future collaboration will showcase technology options and help to develop accurate and cost-effective approaches to carbon capture and storage. This meeting provided a mechanism for forming partnerships, facilitating closer coordination of carbon sequestration activities already being undertaken, strengthening international collaborative efforts in developing carbon sequestration technologies, and mobilizing international resources.

U.S. Approach to Climate Change

The U.S. approach to climate change can be characterized by the following:

- ▶ Based on scientific research
- ▶ Harnesses the power of markets
- ▶ Depends on technology cooperation
- ▶ Ensures economic growth
- ▶ Seeks global participation



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- 1. Discussing options for power generation from sugar cane waste, Punjab.
- 2. U.S.–India collaboration on climate change during COP-8.
- 3. Construction of the Green Business Center, Hyderabad, Andhra Pradesh.

To further explore opportunities for U.S.–India cooperation, USAID–New Delhi convened a focus group meeting which was held during March 2003 to identify key Indian issues and stakeholders. The meeting, facilitated by the Indian non-governmental organization (NGO) Development Alternatives (DA), was attended by approximately 35 participants from the public and private sectors, including representatives from the Ministry of Environment and Forests, the Ministry of Non-Conventional Energy Sources, the Department of Science and Technology, and the National Thermal Power Corporation (NTPC), among others.

The focus group helped explore five specific ideas that have since been drafted into an agreement signed between USAID and the U.S. Department of Energy (USDOE). The agreement has been endorsed by NTPC as the bilateral partner under the Greenhouse Gas Pollution Prevention Project (GEP).

This publication illustrates the new program of cooperation and identifies key contacts in India and the United States. The purpose of this publication is to provide a general overview and introduction to these new activities. Additional stakeholders will be identified who can contribute to achieving significant greenhouse gas mitigation in the years to come. In the case where activities have been implemented, a brief description of the

accomplishments and current status is also provided.

Global climate change is a complex and multi-faceted issue. Solutions are not easy and will require a long-term commitment and adequate resources to address effectively. With greater awareness of climate change issues and opportunities, strategies can be collectively crafted that have a significant impact on emission reductions over time.

The U.S.–India Partnership on Climate Change shows significant potential for identifying ways and means to address climate change between our two countries.



building on success

USAID's Greenhouse Gas Pollution Prevention Project (GEP)

GEP is the U.S. Agency for International Development's largest climate change activity worldwide. It is a \$39 million 13-year effort to reduce the emission of greenhouse gases (GHG) through efficiency improvements in thermal power generation, sugar mill cogeneration, and improved municipal services in the areas of transport and solid waste management.

Since 1997, results from GEP activities in terms of CO₂ avoided have been carefully documented. New technologies have been demonstrated and institutions created and strengthened to carry on this important work well into the future. Primary GEP partners include the **U.S. Department of Energy** and the **National Thermal Power Corporation**. Activities are coordinated with various other groups including financial institutions such as the **Industrial Credit and Investment Corporation of India (ICICI) Bank** and the **Infrastructure Development and Finance Company (IDFC)**, NGOs such as **Development Alternatives** and **Winrock International India (WII)**, and industry groups such as the **Confederation of Indian Industries (CII)**, and private sector representation from sugar mills. The **Louis Berger Group, Inc.** provides technical assistance and training support.

New activities have now been approved under GEP to reduce GHG emissions by promoting the use of alternative fuels and clean energy generation and utilization, and by helping to create a regulatory environment where efficiency improvements are rewarded. Five new tasks under GEP include:



Clean Alternative Fuels

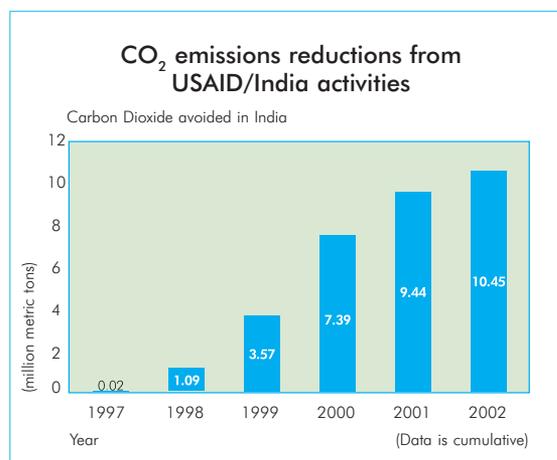
Issues related to the safe introduction of Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG), ethanol and other bio-fuels in the transport sector are addressed. In addition, the expansion of electric vehicle technology may also be pursued. The identification and promotion of specific approaches and technologies that will further the adoption of hydrogen in India and the region as a viable mobile fuel source will be explored. The task will facilitate demonstration of viable clean alternative fuel technologies with an attempt to move them toward commercialization.



Hydrogen Economy

A road map for a hydrogen economy will be developed, with particular attention paid to the commercial introduction of fuel cells in India for stationary and mobile applications for emission reductions. The promotion of fuel cell technologies will form an important component during the transition phase. This task will be complemented by hydrogen technology demonstration activities. Activities within the hydrogen economy include:

- Identifying a role for hydrogen technology in achieving increased prosperity, enhanced quality of life, environmental protection, and sustainable development.
- Identifying needed innovation in energy carrier production and use in fulfilling this role.
- Defining critical scientific and technical gaps and developing an approach to closing them.
- Delineating necessary actions leading to technology commercialization.
- Testing and updating the content of the road map by communicating with a broad segment of public and private organizations within India.





- 4. GEP transport component, Hyderabad, Andhra Pradesh.
- 5. Efficient traffic management in Hyderabad, Andhra Pradesh.
- 6. U.S. and Indian scientists strategizing near Gorbi coal mine, Madhya Pradesh.

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Decentralized Energy Systems

Alternative clean energy concepts, methodologies, and technologies that can be implemented in a distributed as opposed to the traditional centralized mode shall be assessed, demonstrated, and promoted for GHG emissions reduction. Institutional linkages to help commercialize and disseminate these technologies will be strengthened. Specific activities include:

- Evaluating the potential for the introduction of clean energy sources in a decentralized system, such as hydrogen and alternative fuel sources, generation, and economics.
- Promoting and demonstrating distributed generation technologies, such as microturbines, fuel cells, advanced engine systems including those using hydrogen or other alternative fuels, solar, small-hydro, and combined heat and power systems. Quantifying the technical, economic, and environmental benefits with respect to conventional, centralized generation and distribution systems.
- Linking financial institutions to the activities in order to facilitate future commercialization of approaches and technologies.
- Developing institutional partnerships for promoting clean energy initiatives.
- Organizing training and exchange programs leading to greater interaction between Indian and U.S. public and private sector, academic and non-government organizations to foster climate friendly solutions.



Regulatory Framework

A platform will be created to enhance communication among power generators, regulators, government, courts, and the public. The platform will assist the Government of India (GOI) and power generators in India to identify regulatory structures that provide incentives to improve generating efficiency. Experts will be made available to evaluate the effects of electric rate structures on initiatives, such as plant-level efficiency improvements, cogeneration, and the introduction of new, high efficiency power generation technology (central station or distributed). Market incentives for promotion of distributed generation relying on cleaner fuels (such as from renewable sources) will be identified and the feasibility of implementation will be explored.



Communication and Outreach

A coordinated public outreach campaign designed to enhance consumer and policy maker awareness of the relative costs and benefits of current energy sector practices and technologies in India will be designed and carried out. The story of past, current, and future GEP accomplishments will be told repeatedly in a multitude of formats. Key to the success of this activity will be the identification and promotion of credible non-governmental organizations that can play a lead role in energy and environment education and outreach.

elements of partnership

Several broad areas of collaboration have been defined between India and the United States. The activities that make up the U.S.–India Partnership on Climate Change have been divided into the categories of

- **research**
- **technology cooperation**
- **carbon sequestration**
- **market-based and institutional approaches**
- **adaptation**

They are described below.

U.S.–India Climate Change Principal Partners

India	United States
<ul style="list-style-type: none">• Ministry of Environment and Forests (MOEF)• Department of Science and Technology (DST)• Indian Meteorological Department (IMD)• Ministry of Agriculture (MOA)• Ministry of Power (MOP)• Ministry of Non-Conventional Energy Sources (MNES)• National Thermal Power Corporation (NTPC)	<ul style="list-style-type: none">• U.S. Department of State (DOS)• National Oceanic and Atmospheric Administration (NOAA)• U.S. Agency for International Development (USAID)• U.S. Department of Energy (DOE)• U.S. Environmental Protection Agency (EPA)



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7. Control room in Rana Sugars co-generation plant, Punjab.

8. Solar financing partnership between public and private sector in Karnataka.

research

There is still much that we do not know about the climate system. The scientific underpinnings need to be illuminated further so that we can make good choices. Policy makers need information to be able to choose among alternate strategies. Industry needs to be able to select the most appropriate technology. Citizens need to be aware of the potential impacts of climate change on their quality of life. For all of us to optimally invest scarce resources, we need to better understand the links between greenhouse gas emissions and climate change.

U.S.–India Partnership research activities will:



Initiate dialogue to exchange technical information among leading economic and environmental modeling experts from India and the United States. Discussions with Indian partners have begun to identify key topics of interest. A follow-on workshop will take place in January 2004.



Through scientific exchanges, technology cooperation and capacity building, identify collaborative projects such as climate forecasting and applications, carbon and ocean measurements, simulation modeling, and diagnostic analyses to increase the quantitative understanding of climate variations and change and their impact on India and vulnerable populations. Scientists from India and the United States will jointly develop ideas and access new technologies to enhance India's ability to collect, store, retrieve, and disseminate data related to global climate change.



9. Climate forecasting can help rural populations adapt to climate variations.

technology cooperation

Significant improvements in the efficiency of power generation, emissions from the transport sector, and environmental protection have occurred in India in the recent past through the use of cleaner technologies. Public-private partnerships have been at the forefront of promoting technologies and practices resulting in real reductions in greenhouse gas emissions. Of particular significance is the fact that these reductions have occurred while the Indian economy has continued to grow.

As an example, U.S. Energy Secretary Spencer Abraham has recently stressed the importance of international cooperation to build a hydrogen economy. This paradigm of a partnership where both India and the United States find mutual benefit will continue to play an important part in U.S.-India relations. Numerous opportunities remain for greenhouse gas reduction such as promotion of clean fuel alternatives, distributed generation, renewable energy, and hydrogen.

U.S.-India Partnership technology cooperation activities will:



Cooperate to implement the Government of India's new Rural Electrification Supply Technology (REST) Mission, which will provide electrification using distributed generation systems to villages across India. Cooperation will include information, technical tools, and the sharing of technical expertise including strategic planning for rural electrification, assessment of wind and solar resources, technology verification and testing, commercialization of promising technologies, training of service delivery personnel, development of productive use applications, and financing.



Address key technology issues related to efficient and safe extension of CNG, LPG, ethanol and other alternative biofuels into the transportation sector. Experts, working within appropriate Indian Ministries, will conduct cooperative research, technical assistance, training and information sharing activities. Other tasks within this project include identification of best technologies and practices that lead to pollution abatement, quality control and assurance, and demonstration activities. Two conferences on utilization of biofuels and ethanol hosted by Winrock International India (WII) and Industrial and Technical Consultancy Organization of Tamil Nadu, Ltd. (ITCOT) took place during 2003.



Develop a comprehensive road map for creation and implementation of hydrogen-related technology for India. This capability would include aspects of resource assessment, production, storage, distribution, power generation and delivery infrastructure, codes and standards, energy technologies, and the impact of such technologies on sustainable development.



Introduce advanced distributed generation (DG) technologies to support electricity distribution reform, improve transmission and distribution efficiency, and bring power to underserved areas. Evaluate the potential for introducing clean energy sources in a decentralized energy system. Promote and demonstrate selected DG technologies and identify technical, economic, and environmental benefits. Develop institutional partnerships to promote these initiatives and increase interaction among the private and public sectors, academic, and non-governmental organizations to foster sustainable development solutions.



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- 10. Conference to discuss promotion of ethanol fuel.
- 11. REVA electric vehicle — a joint venture between U.S. and Indian technology.
- 12. Solar energy power station on Sagar Island, West Bengal.
- 13. Wind mills on Sagar Island, West Bengal.



carbon sequestration

Despite our best efforts at reducing carbon intensity or improving the efficiency of energy production and use, we will still need to develop activities that will serve to capture and store carbon emitted through human activities. Natural resources such as trees provide a good sink for carbon storage or sequestration, as well as create multiple other benefits for a country like India. Therefore, the forestry sector is a priority.

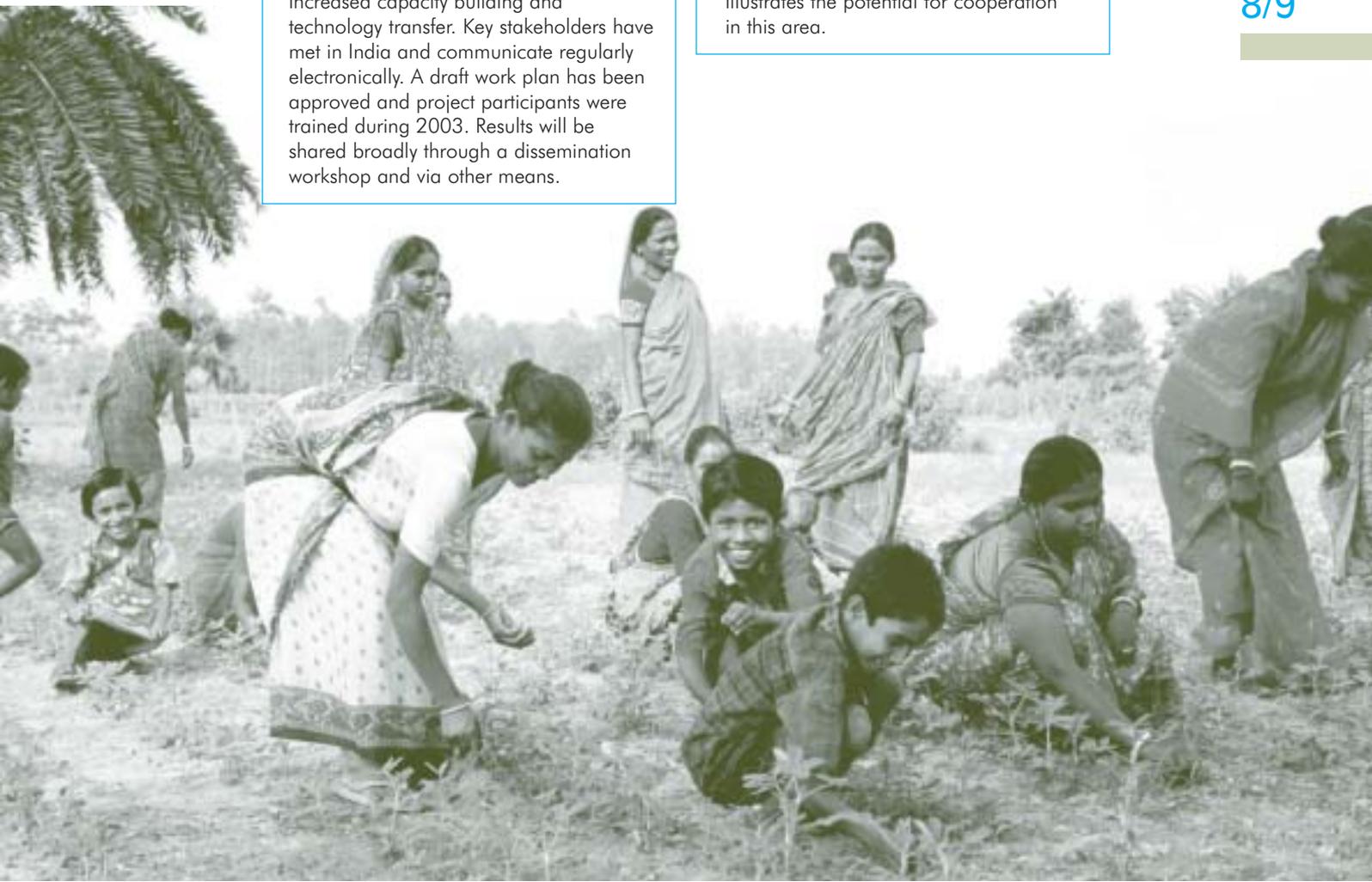
Initial U.S.–India Partnership sequestration activities will:



Enhance cooperation on forest sector carbon management through national and regional modeling of costs and carbon sequestration potential, and evaluation of costs and benefits of forestry activities through two or more case studies. Joint research will lead to increased capacity building and technology transfer. Key stakeholders have met in India and communicate regularly electronically. A draft work plan has been approved and project participants were trained during 2003. Results will be shared broadly through a dissemination workshop and via other means.



Other forms of carbon sequestration such as storage of CO₂ in unproductive coal seams, depleted oil and gas reservoirs, saline aquifers, and deep oceans also show great promise and may be pursued in the future. The Carbon Sequestration Leadership Forum (CSLF) discussed earlier illustrates the potential for cooperation in this area.



market-based and institutional approaches

Policy, institutions, and public opinion can drive technology and influence the success of activities. The United States has considerable expertise and proven approaches that allow industry to reduce emissions cost-effectively and, capture the financial benefits of improved efficiency that can be shared with customers. The United States also has considerable experience with methods that permit the public to have a voice in the decision making process. Market incentives that allow for efficiency gains and clean energy choices are needed.

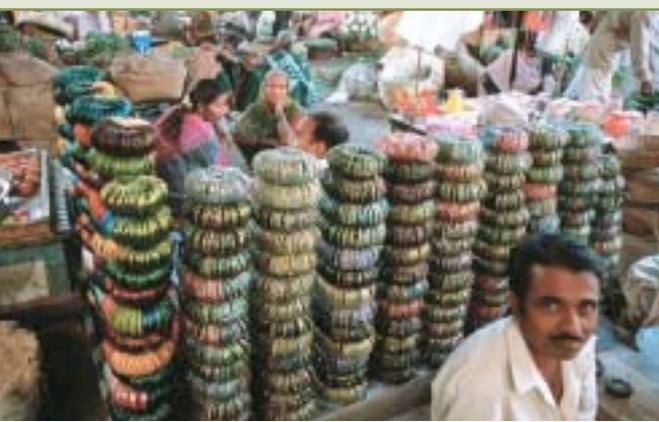
It is important to translate research findings and information into a format that resonates with the target audience whether they are policy makers or citizens off the street. Illuminating the connections between various energy sector choices and environmental conservation, human health, and economic prosperity facilitates the communication process. Communication is an important step in changing behaviors and influencing policy and helps pave the way for business, financial, and technical interventions.



15. Industries and municipalities need to assess waste disposal options.

U.S.-India Partnership market-based and institutional approaches will:

- Assist decision makers in the development and implementation of clean energy policies and programs by demonstrating the health and economic benefits of actions that simultaneously improve air quality and reduce greenhouse gas emissions. Activities are currently focused in Hyderabad. An implementation plan that recommends specific approaches and assesses their relative costs and benefits will be presented during 2004. This plan will draw upon recently completed greenhouse gas and conventional air pollutant inventories and the development of alternative scenarios, air quality monitoring and health effects valuation.
- Build on past success to promote energy efficiency improvements in partnership with key stakeholders in the Government of India and private sector. This work will also provide expertise in accounting for GHG emission reductions and related benefits from these efforts.
- Enhance capacity in the use of market-based approaches to air quality management in India by focusing on measurement and monitoring at the source. Indian partners will further develop India-specific measurement methodologies for select sectors. An in-country research institute will be engaged for this purpose. Training was initiated in Pune during 2003.
- Reduce barriers to distributed generation and efficiency improvements by creating a platform for dialogue among power generators, Central and State governments, regulators, and the public. Assist GOI Ministries and power generators to identify regulatory structures elsewhere in the world that may provide incentives to improve efficiency or that reduce barriers to doing so.
- Promote outreach and communication on clean energy technologies to facilitate understanding and adoption of these goods and services. Public understanding of technology and best practices will be articulated. This will help to build coalitions amongst stakeholders and disseminate best practices and alternative approaches to enhance awareness leading to more rapid technology adoption.



16. Glass and bangle industries near the Taj Mahal are adopting environmental management systems.



adaptation

An examination of the Delhi Declaration and other documents emerging from United Nations Framework Convention on Climate Change Conference of Parties No. 8 (COP-8) reveals that the adaptation theme is woven throughout and is taking on more prominence in international discussions. The GOI has repeatedly cited its interest in adaptation, as have various NGOs including Development Alternatives (DA) and The Energy and Resources Institute (TERI). The United States has acknowledged the importance of this theme and is strengthening its programs to address it.



17. Climate modeling is useful in drought preparedness.

10/11

U.S.–India Partnership adaptation activities will:



Facilitate the use of climate information to increase adaptive capacity to changing climate across timescales and improve resource management within climate-affected sectors. These cooperative efforts will include an assessment of potential consequences of climate variability and change to support improved resource management; and evaluation of adaptation strategies to increase resilience to climate variability and change. Expert consultation will identify mutual interests in the exchange and application of methods and tools to jointly conduct place-based and issue-specific assessments of the relationship between human systems and the changing climate across timescales; and forecast and apply climate information and evaluate alternative strategies and decision-support tools with the aim of increasing resilience in sectors affected by climate.



Foster dissemination of agro-meteorological information and monsoon research to rural areas through radio broadcasts. Technical experts will develop a proposal to identify and start appropriate tasks on the use of information dissemination technology for rural populations.



Explore future actions that simultaneously promote sustainable development and build resilience to climate change impacts.



We should work together... to craft a brighter future



18.



19.



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18. Collaboration at the highest echelons of government.

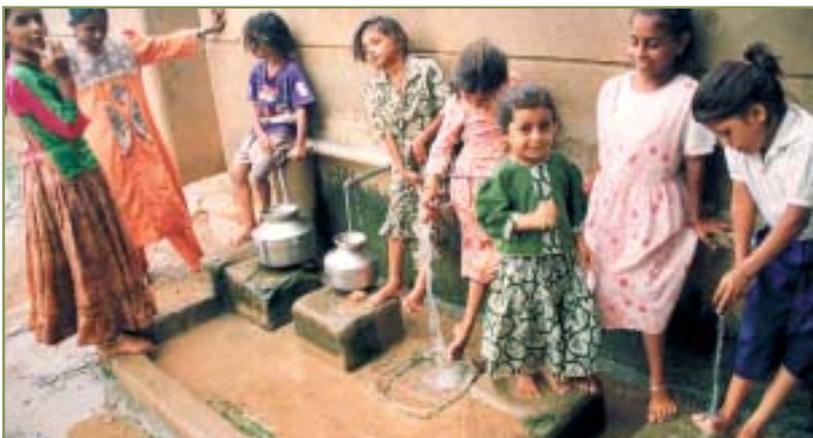
19. Fly ash pond near Singrauli power station, Uttar Pradesh.

20. Transmitting green power from Rana Sugars, Punjab.

conclusion

Climate change is an issue of great importance for both the United States and India. By working together, the United States and India have realized significant reductions in the emission of greenhouse gases over the years.

Together, our two nations can accomplish a great deal more in future years. This document contains the broad parameters of current and future bilateral cooperation on climate change. Successful implementation will require ingenuity, resources, and a vision of shared responsibility. Both countries have the capability and the will to rise to this challenge.



21. Collaboration can help improve the quality of life at all levels.



22. Rural family in Karnataka utilizing solar energy.

Key Climate Change Partnership Contacts

India

- **Prodipto Ghosh**
Secretary
Ministry of Environment & Forests
- **C. Viswanath**
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